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Benefits of thermal conversion of wastes

After reuse and recycle there are only two methods that can manage waste matching the rate that it is generated. The two proven means for disposal are burying municipal solid waste or MSW in landfills or thermally converting it in specially designed chambers at high temperatures. The heat generated by combustion or gasification is transferred to steam that can flow through a turbine to generate electricity. This process is called waste-to-energy (WTE). It recycles the energy and the metals contained in the MSW while most of the remaining ash by-product can be used beneficially for maintenance of landfills (in the U.S.) or for road and other construction purposes (in the E.U. and Japan). Waste-to-Energy reduces the volume of MSW by 90 percent; if the remaining ash is reused, this is a nearly "zero waste" solution. Importantly WTE differs from incineration because of the energy generation component.

The WTE industry worldwide has demonstrated safe, reliable use of combustion systems as well as continually improving and developing new technologies such as gasification, pyrolysis and plasma processes to produce myriad products from post-recycle waste streams. These range from grate combustion systems that produce heat and electricity to gasification processes that produce a synthesis gas (carbon monoxide and hydrogen), the building block to make liquid fuels to compact plasma systems that can do both. For example, Michigan currently has three combustion facilities (Detroit, Grand Rapids and Jackson) processing 1,505,238 tons of MSW producing 785,772 MWh of electricity and 483,727 tons of steam (*ref: Waste-to-Energy State-of-the-Art-Report 6th Edition August, 2012, International Solid Waste Association (IWSA) Report, Ed. RAMBØLL Danmark A/S, Copenhagen, Denmark*). This amounts to about 8% of the total MSW generated in Michigan supplying nearly 1% of the electricity demand. Therefore nearly 10% of the state's electricity is lost by sending the remaining MSW to landfills. Although there are no gasification facilities yet in Michigan; DTE, based in Ann Arbor, is currently working with the Montmorency-Oscoda-Alpena Solid Waste Management (MOASWMA) to construct a facility.

These are great starts as they provide in-state energy generation in an environmentally sustainable way. It has been proven through carbon-14 methods (ASTM D6866 protocol) that typical MSW WTE stack emissions contain ~65% biogenic CO₂, i.e. renewable bio-carbon. Therefore Michigan's use of the three WTE facilities avoids approximately 500,000 tons of greenhouse gases and will be improved when the gasification facility is completed. WTE processing of MSW in-state has the additional benefit of reducing the transport of MSW to distant landfills and the attendant emissions and fuel consumption.

A recent summary of the landfill and waste-to-energy meeting on climate impacts of the US waste management industry was held in Washington DC in January 2009. A consensus was

reached on a number of items but one stands out. It was "On an overall LCA basis, WTE is environmentally preferable to landfilling." Recently the Architect of the Capitol (AoC) stated that waste generated by those on capital hill will be sending it to a WTE facility, recognizing the dual benefits of generating renewable energy and managing waste. This is in response to Nancy Pelosi's "Green the Capitol" initiative. In my city, New York City, there has been major opposition to WTE facilities however currently 511,000 tons per year of NYC trash is sent across the Hudson river to be converted in a WTE facility in Essex NJ giving the citizens there the revenue from tip fees and electricity generation. Revenue that is lost for NYC. Encouragingly NYC just announced they will contract to send 800,000 tons per year to nearby WTE facilities instead of long haul to landfill.

Currently there are 87 WTE facilities in the U.S. processing 29 million tons of MSW annually and generating 2.3 GW of electricity. As our nation begins to focus on conservation and renewables, WTE has already proved to be a reliable technology. However more can be done. An article in the New York Times by Ms. Elizabeth Rosenthal described how Europe, in particular Denmark, utilize WTE extensively and how the US lags behind in implementation. A follow up running commentary on the story in the "Room for Debate" section where the public submit comments demonstrated 57% were in favor and only 24% where against. My presentations to prestigious organizations such as the National Academies of Science, American Institute of Chemical Engineers and the American Chemical Society all result in positive reaction from the audience with the typical question "why are we not doing more?"

WTE utilization is fully compatible with recycling. Worldwide data shows that communities that utilize WTE have higher recycling rates than those that do not. WTE or thermal conversion facilities have the ability to process the trash generated at the rate generated by the public. Other companies are looking to thermal conversion to chemicals, thus recognizing the value in the MSW that typically is buried in landfills.

I am a chemical engineer and one of the fundamental tenets is closing a material and energy balance. WTE does just that. It is unclear to me, and frankly quite surprising, why so-called environmental groups resist the implementation of processes that can handle the rate of waste generation, produce energy, recover metals, preserve land and avoid mining and importing of fossil energy. The data and track records are clear that WTE implementation needs to be increased to help the US progress on a more sustainable path.

Respectfully Submitted,


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